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THE WHITE-TAILED DEER OF EASTERN UNITED STATES

BY THOMAS BARBOUR AND GLOVER M. ALLEN

[Plates 4-5]

Naturalists and sportsmen long ago remarked the large size of adult white-tailed deer of New England as contrasted with the appearance of deer from the South Atlantic States. Baird (1857) compared specimens from New York with those from Virginia and South Carolina, pointing out that the latter seemed to average smaller. Following him, Dr. J. A. Allen (1871) briefly remarked the same contrast between the deer of the northeastern states and those of Florida. Cory (1896) in his *Hunting and Fishing in Florida* devotes a brief chapter to deer, and makes the more definite statement that "the Florida Deer is smaller and varies slightly in color from the true *C. virginianus*. A full-grown buck will often not weigh over 110 pounds, although I have killed them considerably larger, and probably they occasionally (though rarely) approach in size their Northern relation." Dr. C. Hart Merriam in his *Mammals of the Adirondacks* (1884, p. 4) says, "Our deer are much larger than those of the South and Southwest, adult well-conditioned bucks averaging from 200 to 225 lbs. avoirdupois in weight, and exceptionally large ones being much heavier. Hence the Adirondack Deer is more than double the size and weight of the same species in Florida." In a brief and unsigned review of Cory's book, Dr. Elliott Coues (in *The Nation*, vol. 62, p. 404, 1896) emphasizes the difference in size between the northern representatives of certain species and those occurring in Florida, and casually proposes two new names, one for the Florida red bat (*Atalapha borealis peninsularis*) and one for the Florida deer (*Cariacus fraterculus*). Both names are *nomina nuda* and furthermore the two forms in question had been described and

named shortly before, the bat by Rhoads, the deer in a preliminary paper by Mr. Outram Bangs (1896) who at that time was energetically investigating the mammalian fauna of Florida preparatory to the publication (in 1898) of his summary of the species known from the state. In naming the Florida deer *Cariacus osceola*, he unfortunately lacked specimens of typical *virginianus* for comparison, but contrasted the deer of northern Florida with the large deer of Maine which at that time was believed identical with typical *virginianus*, but was later named by Miller (1900) as a distinct race, *borealis* (type from Bucksport, Maine).

Although it was originally thought that the Florida deer differed so markedly from typical *virginianus* as to constitute even a distinct species, the gradual accumulation of additional facts and specimens in the intervening years has shown that the supposed sharp distinctions were after all of only relative value, until it became finally a question whether or not the deer of Florida were really distinct from true *virginianus* with which as yet it had not been carefully compared.

With these facts in mind one of us (Barbour) has spent no little time and effort during the course of several visits to Florida, in gathering notes and material, particularly skulls, that might throw light on the relationships of the white-tailed deer of the peninsula. Such great changes are now taking place in the way of clearing large areas of woodland, building railroads, and constructing drainage canals in Florida that the distribution and abundance of so large an animal as the white-tailed deer cannot but be changed very considerably within a few decades. The importance of obtaining adequate material to illustrate its present distribution is, therefore, obvious.

In the course of our work it at once became clear that an adequate idea of the characters of typical *virginianus* was essential, and this made necessary a re-examination of the status of the northern race *borealis*. Of Florida specimens, in addition to three of the original four representing Bangs's *osceola*, the Museum of Comparative Zoölogy now has a series of skulls from Cumberland Island, Georgia, a series from the vicinity of Palm Beach, Florida, and a third lot from Chokoloskee in extreme southwestern Florida, as well as a few from other localities in northern Florida and three others from Big Pine Key, some 130 miles south of Miami. Years ago by permission of the New York authorities Barbour was able to obtain specimens in summer coat from the Adirondacks, which with the type and other specimens in the Museum of Comparative Zoölogy fairly represent the northern race *borealis*.

Thanks are due the U. S. National Museum and the Biological Survey for the loan of skins and skulls to supplement the few in the Museum representing typical *virginianus*; also to Maj. Allan Brooks for additional notes and sketches from Florida.

The material now before us, though still inadequate, embraces a fairly considerable series of skulls from eastern North America, together with skins representing winter and summer pelages of both sexes. A study of these specimens seems to indicate that occasionally deer may attain as large a size in northern and east-central Florida as in Virginia or Maine and that there is no natural discontinuity in the general distribution of the species from north to south on the mainland. The northernmost deer have been considered as representing a large subspecies with longer tooth rows and bigger antlers, but in dimensions adult Maine skulls can be matched by those from Palm Beach, Florida. It is further apparent that the northern race *borealis* (type locality Bucksport, Maine) is at best a poorly marked subspecies characterized perhaps by its more widely spreading antlers, much longer winter coat, and slightly brighter color in summer. The deer of the extreme southern tip of Florida on the other hand is very small indeed, with a small skull and small delicate antlers, yet with a tooth row very little reduced in absolute size from that found in typical *virginianus*. To this we propose to restrict the name *osceola*, considering the type, and other specimens from Citrus County, to be extreme intergrades, and standing really nearer to true *virginianus* than to the small deer from the tip of the peninsula. Finally, we are describing as a very distinct geographic race the small pallid deer with reduced tooth row that inhabits the southernmost keys of Florida. These four races of the eastern United States may be characterized as follows:

Odocoileus virginianus virginianus (Zimmermann)

VIRGINIA DEER

Dama virginiana ZIMM., Specimen Zoologicae Geographicae, p. 351, 1777.

Type.—Based on Pennant's Synopsis, 1771, p. 51, pl. 9, fig. 2 (antlers).

Type locality.—None specified beyond "America," though assumed to be Virginia; but the references are to Lawson's and Catesby's works on Carolina.

Diagnosis.—Adults nearly or quite equalling in size the race *borealis*. Color of summer and winter pelages markedly different; in summer the coat is bright, nearly uniform ochraceous buff on dorsal surfaces of neck, body and legs; in the winter pelage the hairs of the back are black-tipped with a narrow subterminal band of pale ochraceous giving a much darker, ticked appearance. Upper cheek teeth 73-81 mm.

Description.—A fawn (2395 M. C. Z., from Citronelle, Florida, August 4, 1894) is nearly uniform "ochraceous buff" on the head and body above, paling to "warm buff" on the limbs and sides of neck and body; body spotted with white in a definite pattern: a line of spots on each side of spine from occiput to root of tail, succeeded by four or five less regular broken lines of spots on the sides from fore shoulder to haunch. Black bases of long hairs of tail showing through at the edges.

An adult male *in summer* (108038 U. S. Biol. Surv., July 17, 1894, Citronelle, Florida, taken as representing the extreme southern *virginianus*) has the forehead, neck all around, body and limbs above ochraceous buff, slightly warmer on forelegs, the center of back slightly darkened by showing through of a dark brownish band occupying about the middle third of each hair; sides and tip of tail above blackish with white fringe of long hairs from under side; ears dusky.

Adult *in winter* much darker, the crown, neck all around, and the body, a finely grizzled mixture of pale ochraceous buff and dusky—nearly "sepia,"—each hair with a fine blackish tip, a narrow subterminal ring of pale ochraceous and then a long dusky portion, paling out toward the base. Short hair on cheeks and muzzle similar but the pale band nearly grayish. Younger animals have the ochraceous buff less intense. A female from South Carolina, probably a yearling, has the pale annulus nearly "light buff", clearer on the legs but on the body much subordinated, producing a very dusky appearance with a clear dusky median stripe extending over the upper surface of the back and tail.

Skull.—Adult skulls equal in size those of average *borealis*, nor are the tooth rows inferior in length. The antlers of the average adult male have, as is well known, an inner tine a short distance above the burr, and three others on the upper side of the beam, the most proximal of which is usually the longest. Occasional especially vigorous adults have additional tines which may be irregularly developed. The basal portion of the antler from the burr to the first tine is on the average set at only a slight angle to the long axis of the skull, so that the line from burr to tip of basal tine tends to be more or less parallel to that axis and results in giving the tips of the beams in adults a tendency to approximate each other more or less closely. Nevertheless, this is not invariable, and occasional heads of southern deer have the antlers depressed and as wide-spreading as those in the North.

Weight.—Reliable weight-records for typical Virginia deer are not readily available. Cory (1912, p. 62) writing of the deer in Florida, states that though full-grown bucks often weigh not over 110 pounds, "these, however, are smaller than the average, and I have killed at least one specimen in southern Florida which weighed more than 200 pounds. . . . For many years I carried steelyards with me in the field for the purpose of weighing large game. One buck weighed 204 pounds and during a dozen years I have killed others which . . . were fully as large." A hunter who has killed many deer in Volusia County, Florida, assures us that the deer in Palm Beach County, to the south, where he has hunted of late years, average some thirty pounds less, indicating probably a gradual diminution in bulk as one proceeds southward.

Remarks.—Some difficulty has been experienced in determining the color characters of the typical Virginia deer, for lack of summer skins from near the type locality. While the limited material at hand seems to indicate that the

northern deer are slightly more tawny in summer without the darkening of black-ticked hair on the back, it may prove on examination of larger series that the difference is less than supposed.

In regard to the use of the specific name *virginianus* of Zimmermann instead of *americanus* credited to Erxleben (1777), it seems perfectly clear that the latter did not intend his adjectival use of *americanus* as a new name; nor does it occur in the same typographical form as the new names proposed in the same work (see J. A. Allen, 1900, p. 318; 1902, pp. 15, 18; W. H. Osgood, 1902, p. 87; O. Thomas, 1913, p. 585, footnote). Pennant, in his brief account of the "Virginian Deer," (the basis of Zimmermann's name) refers to Lawson's and Catesby's accounts of the natural history of the Carolinas, and quotes Ray's *Dama virginiana*, which no doubt was adopted by Zimmermann in turn. His figure of the antlers is unmistakable, though portions of his text seem to refer rather to the caribou.

Specimens examined:

MARYLAND: Cumberland, 3 (skulls).

VIRGINIA: No locality, 1 (skull); Appomattox River, 1 (skull); Claremont, 1 (skull); Highland County, 1 (skull); Hot Springs, 1 (skull); Richmond, 1 (skull); Rowleysburg, 1 (skull); Winchester, 1 (skull).

WEST VIRGINIA: Meadow Creek Mountain, 1 (skull).

NORTH CAROLINA: Halifax, 1 (skull); Halifax County, 1 (skull).

SOUTH CAROLINA: Colleton County, 2 (skulls); Georgetown, 1 (skin); Green Pond, 1 (skull).

GEORGIA: Cumberland Island, 7 (skulls).

ALABAMA: Mount Vernon Barracks, 1 (skull); Orange Beach, 1 (skull); Ten-saw River, 1 (skull).

FLORIDA: Eastern Florida, 1 (skull); Big Cypress 25 miles southeast of Lake Trafford, 1 (skull); Brevard County, Kissimmee Prairie, 3 (skulls); New Smyrna, 1 (skull); Palm Beach et vic., 6 (skulls, one with headskin) and 3 pairs of antlers with frontlets; Sebastian, 1 (skull).

KENTUCKY: Big Bone Lick, shed antler.

Odocoileus virginianus borealis Miller

NORTHERN VIRGINIA DEER

Odocoileus americanus borealis MILLER, Bull. N. Y. State Mus., vol. 33, p. 83, October, 1900.

Type.—Adult male, skin and skull, 4999 Mus. Comp. Zool. (Bangs Coll.), from Bucksport, Maine, December 12, 1895.

Diagnosis: Similar to typical *virginianus* but summer pelage redder, the feet usually with conspicuous fringe of white hair between the toes; size on the average a very little larger; antlers usually coming off from forehead at a greater angle giving a slightly flatter spread, with less tendency for the tips of the beams to converge. Upper cheek teeth average 83 mm.

Color.—A fawn in full spotted coat (14913 M. C. Z. from Tupper Lake, Adirondacks, New York, August 25) is clear "tawny" on the upper neck, back and dorsal surface of tail, paling to a light "cinnamon" on ventral surface of neck, on the limbs and lateral line; ears mixed grayish externally. It is much more

tawny than a perfectly comparable *virginianus* fawn. The lines of white spots as in the typical race.

Adult in summer, (14921 M. C. Z., ♀, from Tupper Lake, New York, August 24) uniform tawny above from crown to tail without intermixture of dark-tipped hairs, paling at the sides, on limbs and front of neck to cinnamon; sides of muzzle pale grayish, the backs of the ears and a median line on the muzzle dusky. A conspicuous fringe of white hair between the toes of both fore and hind feet.

Adult in winter (4999, type, ♂, from Bucksport, Maine, December 12) identical with typical *virginianus* in corresponding season, but with the pelage longer than in deer from the extreme south of its range, and with a conspicuous fringe of white hair between the toes.

Skull.—We have been unable to discover any characters that will uniformly separate skulls of northern deer from those of Maryland, Virginia, Georgia, northern and central Florida. While skulls from the north tend to be large, they can be closely matched in the series from Palm Beach, Florida. In adult males, however, it is much more usual to find the basal portion of the antler coming off at a wider angle, so that not only does the basal tine often point in or form a wide angle with the main beam (instead of nearly continuing its basal axis) but as a result the beams are more spreading and seldom have their tips so closely approximated as in well developed heads of *virginianus*. The skull of the type of *borealis* is unusually large and the antlers more spreading than in the average deer from the North.

Measurements.—See table (p. 76).

Remarks.—In the brief diagnosis of this northern race (Miller, 1900) true *virginianus* is distinguished by its relatively small teeth ("lower row of cheek teeth 75" mm.) and by having the "winter pelage not conspicuously grayer or coarser than summer pelage," whereas *borealis* has relatively large teeth ("lower row of cheek teeth 85" mm.) and the winter pelage is "coarse, usually much tinged with gray, very different from summer pelage." The material now available shows that these criteria do not all hold good.

Phillips (1920, p. 132) has lately shown that in 95 adult males from Maine the lower tooth row averages 83 mm. with extremes from 71 to 92. In an adult male from Winchester, Virginia, before us, the lower tooth row is 88, in two others from Virginia, 77 and 81 respectively, and in five adult males from Palm Beach, Florida, 78, 80, 85, 86, 87 respectively. There is probably a very slight average difference between extremes of the two races, but it is hardly diagnostic. As to the supposed lack of a seasonal change in color in the case of the southern deer, it is difficult to see on what ground the supposition rested. For while the adult in summer from northern Florida may not be quite as clear or bright a tawny as an Adirondack deer "in the red" it is quite as obviously different in its close ochraceous pelage of this season from the longer, more mixed "blue" or "gray" of its winter coat. So far as the scant material at hand indicates there is no color difference in winter coats of *virginianus* and *borealis*, except that in Florida one never sees a deer with such a long, shaggy "gray" coat as is assumed, for instance, by Adirondack deer in mid-winter; but the summer coat of the latter in both fawn and adult is apparently a trifle brighter, a clear tawny rather than ochraceous-buff with dark ticking, though how far this will hold true in a larger series is not yet certain. Another striking difference between the northern skins and

the southern ones available for comparison is that the former have a conspicuous white fringe between the toes, lacking in most southern specimens.

Where *borealis* intergrades with *virginianus* and where the southern border of its range may be traced are still matters for further investigation. Probably in the range of *borealis* should be included all of New England and at least northern New York, west to Ontario, northern Wisconsin and Minnesota (Cory, 1912). Whether the deer originally indigenous to southern Connecticut and those of southern New York (Long Island) are better referred to *virginianus* we are not prepared to say. Rhoads considers the larger deer of Pennsylvania *borealis*. Skulls from Maryland, Virginia, West Virginia, the Carolinas, Georgia, Alabama, and northern and east-central Florida are certainly to be considered typical of *virginianus*. The westward limits of both forms and the exact status of the races *macrourus* and *louisianæ* are still matters requiring further study.

Weight.—Large deer in winter coat will generally weigh over 200 lbs., and exceptional individuals considerably exceed this.

Specimens examined.—

MASSACHUSETTS: Lee, 1 (skull).

MAINE: Locality indefinite, 3 (skulls); vicinity of Upton, 33 (skulls); Bucksport, 4 (2 skins and skulls including type).

NEW YORK: Big Tupper Lake, 11 (including 6 skins with skulls).

ONTARIO: 2 (skulls).

Odocoileus virginianus osceola (Bangs)

FLORIDA DEER

Cariacus osceola BANGS, Proc. Biol. Soc. Washington, vol. 10, p. 26, February, 1896.

Type.—A young adult female, skin and skull 2394 M. C. Z. (Bangs Coll.) from Citronelle, Citrus County, Florida, December 29, 1893.

Diagnosis.—In its extreme form, slightly smaller in cranial dimensions, but with tooth rows practically as long as in *virginianus*; general bulk of body considerably less, the antlers much reduced in size; upper cheek teeth 72–77 mm.

Remarks.—In describing the small deer of Florida as a distinct race, Mr. Bangs had unfortunately no specimens from the type locality of *virginianus* for comparison. Of his original series two, including the type, are females decidedly undersized, one of them indeed abnormal in wholly lacking the third upper molar on the right side while the corresponding one on the left side lacks the hypocone, so that the tooth is triangular in outline rather than quadrilateral. The two adult males of the series on the other hand, one from Citronelle, the other from Blitche's Ferry, Citrus County, are good-sized animals, fully as large as typical *virginianus* from farther north. Indeed, it would be perfectly fair to consider the entire series as representing *virginianus* and to make *osceola* a synonym of it. The series of skulls from Chokoloskee, in extreme southwestern Florida, however, indicates unquestionably a valid race in that part of the peninsula, characterized by its very much reduced antlers, slightly smaller skull, and light weight. For the present, therefore, it seems better to restrict the name *osceola* to these small deer of southern Florida, and to assume in lack of evidence to the contrary that

this form extends northward on the Gulf Coast, intergrading with true *virginianus* in the region of Citrus County and southeastward. Specimens from the type locality would therefore be intergrades, more nearly approaching *virginianus*.

In the six adult males from Chokoloskee, the finest head (pl. 5, fig. 5) has antlers with the beam only 375 mm. long on the outer curve, basal tines 23 mm. long (570 and 85 in a head from southern Maryland), and two additional tines on each beam. Another old animal has two very small points (one broken off) on the right beam, and none on the left. Both beams are thick, with heavy burring at base and directed nearly straight back. The other heads all show a very small delicate beam with basal tines small or in some cases absent entirely, and with at most two short tines additional (pl. 5, figs. 6, 7). Two heads are asymmetrical: one has a simple beam on the right side without tines, while that of the left side has two small prongs; the other head has no basal tines, but two points on the right and one on the left side.

The type of *osceola* is peculiar in having the ascending arm of the intermaxillary widely in contact with the outer tip of the nasal on each side. Almost always, whether in specimens from Florida or from farther north, these two bones are separated by an intervening strip of the maxillary, varying in width from 1 to 18 millimeters, so that the condition described is unquestionably abnormal. It is certainly not a character of any systematic importance as it was originally supposed to be.

Unfortunately no skins from extreme southern Florida are available, and since those from the type locality are quite as well referable to *virginianus*, it may be said that the color characters of this race in its extreme form are still imperfectly known. Hunters at Key West assure us that all the mainland deer undergo a seasonal change similar to that of the deer farther north.

We have seen no specimens from the region between Chokoloskee and Palm Beach, a distance of some 125 miles. The large deer of the latter region must be referred to typical *virginianus*. It may be assumed that the range of *osceola* is along the Gulf Coast to the western tip of Florida, avoiding the Everglades to the east and southeast, where no deer occur, a range similar to that of several other geographic forms.

In general the deer of east Florida are diminishing with alarming rapidity. The open country with scattered "hammocks" and almost invariably with myrtle or bay "heads" centering the hundreds of "prairie ponds" makes the deer the hunter's easy victim. The Florida deer are very strictly nocturnal, never moving about in daytime. They are hunted with slow-trailing dogs which do not give tongue, the hunter usually tying the dog to his belt. When a fresh track is picked out the dog simply leads its master to the thicket or "head" where the deer has chosen to spend the day. If the spot be a small palmetto thicket in the piney woods the deer is flushed at a few feet range and killed with buck-shot; if it has evidently "laid up" in a larger hammock or head the hunter puts in the dog on one side and hurries to the other side of the hammock, or if a group are hunting watchers are posted and the dog is loosed to drive out the deer. In cases where the deer escapes it will usually run an almost incredible distance and no further attempt is made to start it again. Until, however, the hunted deer is actually found by the dog, it lies perfectly still and I (Barbour) have often passed and repassed within ten feet of deer which were afterward started with a dog but which

had kept hidden regardless of my presence, smoking, and conversation. There is no question but that Florida deer winter in the "short blue" and never put on the "long blue" coat assumed by deer that winter in the snow.

Weight.—Cory (1896) says that a full-grown Florida deer "will often not weigh over 110 pounds" although he has killed them considerably larger. A writer in *Forest and Stream* (vol. 70, p. 245, 1908) reports one killed at Kissimmee, and thought to be unusually big, that weighed 135 lbs. without the entrails. Most of the Florida deer which Barbour has seen or heard of, killed about Hallandale, Miami or Homestead were rarely more than 120 lbs. after being dressed. A number of specimens seen in captivity in southeastern Florida were uniformly small.

Measurements.—See table (p. 76).

Specimens examined.—

FLORIDA: Monroe County, Chokoloskee, 6 adult ♂, 1 ♀ subadult (skulls); Polk County, Lake Arbuckle, ♀ yg., ? intermediate (skull); Citrus County, Citronelle, 4 (including type) and Blitche's Ferry, 1 (skins and skulls, regarded as intermediates closely approaching *virginianus*).

Between the mainland of southeastern Florida and the southern group of keys, there is a wide stretch of rather large, elongate islands, including Key Largo and the Metacumbe Keys, on which, at least within the memory of those now living, deer have never been found. Farther south still, however, in the "Lower Keys," there have been a few deer for a very long period. These were formerly known as "Spanish deer" because, apparently, it was recognized that they were unlike the deer of the mainland and it was, therefore, assumed that they had been brought by the Spaniards from Central America, as the Key West "conchs" well knew that dwarf white-tailed deer do occur on the coasts of Honduras and Nicaragua which they visit during their turtling expeditions.

These deer are much pursued and have become extremely wary, but a few are killed each year by hunters with dogs. After considerable effort Barbour finally succeeded in obtaining an adult male skull with scalp from Big Pine Key and a younger male in the second or third year. These, with a third young male shot by Mr. W. S. Brooks on the same key, seem unquestionably to represent a very distinct race, pale in color, small of body, and with reduced tooth rows. It may be named:

Odocoileus virginianus clavium subsp. nov.

KEY DEER

Type.—Adult male head-skin and skull, 19120 M. C. Z. from Big Pine Key, Florida, winter 1920 (said in Key West to be the record for size).

Diagnosis.—Smallest of the eastern races of Virginia deer, colors paler, teeth smaller than in the mainland races; upper cheek teeth 67 mm.

Description.—The type and two other immature males agree in the color of the head: in the former the crown and median dorsal line of the neck are "light buff" of Ridgway, darkened by the "bister" of the basal portions of the individual hairs; on the sides of the neck the bister pales out until on the cheeks and the sides and front of the neck, the color is "pale buff." A spot back of the nose and

on the under lip just ahead of the corner of the mouth are bister and the same color extends back from the muzzle to the fore part of the face, where, however, it is finely grizzled with whitish, as are also the backs of the ears. As usual, the spot behind the muzzle, the eye ring, inside and outer bases of the ears, and the upper throat are white. In other words the tawny hue is quite lacking. A similar difference characterizes the remainder of the winter pelage as shown in the two young male skins (both taken in March). The bister is not so deep, nor is the buff so bright ochraceous as in *virginianus*. The combined effect is to produce a very pale-looking animal very different from comparable specimens from the mainland (Palm Beach and South Carolina).

Skull.—Apart from the small size of the skull and antlers, this deer of the "Lower Keys" differs from all the mainland forms here treated in that the teeth are reduced in size, so that not only the length of the tooth row but also the individual teeth are obviously less than those of the other races, in which as already stated, the tooth row is of practically the same length in adults from Maine to southern Florida. All three of the specimens available agree closely in this respect and differ conspicuously from those of the mainland.

The antlers of the type, which according to local hunters, are of record size for Key deer, lack the basal or "crown" point on the right-hand side, but each has in addition two tines on the main beam. The length of the left antler, measured on the outer curve is 309 mm., of the crown point 42 mm.; proximal tine 90, distal tine 50. The tips of the antlers are 185 mm. apart.

Weight.—A full-sized doe is reliably stated to weigh approximately 65 pounds; the larger of the two immature males (No. 18497) was said to have weighed 80 pounds.

Measurements.—See table.

Remarks.—For additional information on the distribution and status of the Key deer we are indebted to Mr. Bascom L. Grooms, Manager of the Key West Electric Co., who has made particular inquiry on our behalf, especially of Mr. Henry Watkins, who has hunted on the keys for some 35 years. Two other hunters of long experience on the keys have corroborated his testimony.

These small deer are now strictly confined to the southernmost group of keys from Big Pine Key on the northeast to Boca Chica on the southwest, a small island some seven or eight miles from Key West. Big Pine Key has always been known as the chief refuge for the Key deer, and they swim back and forth from it to the smaller islands. From the testimony of Mr. Watkins, it appears that about thirty years ago deer were killed on Key West Island, but none has been seen there since. Deer were killed on Stock Island, a small key adjoining Key West, ten years ago (*circa* 1910) but none has since been known there. Proceeding northeastward, there were deer on Boca Chica until about the same time, when they disappeared, and were unknown there until late in 1920 when two were seen. They disappeared from Saddle Bunches Key about nine years ago (1912). They were also found on Sugar Loaf until the hurricane of 1910 when they disappeared, and none has been seen there since that time until the fall of 1920 when they were again reported from the island. Deer have always been found from time to time on Ramrod Key, all three of the Torch Keys, and probably Newfound Harbor. They swim readily from key to key and if hunted on the smaller islands they leave and go back to Big Pine Key. Later they will again appear on the smaller islands.

"It is safe to say that deer are likely to be found at any time on any key between Big Pine Key and Boca Chica and that they are more plentiful now than they were twelve to fifteen years ago. A good hunter was known to jump six deer in one day on Big Pine Key this last winter, (1920-21), when twelve to fifteen years ago it was not uncommon even with good dogs to be unable to jump a deer" there. On the three small keys just north of Big Pine, known respectively as Crawl, Grassy, and Duck Key, deer are said also to have been found, but none of the present-day hunters has ever been able to find deer on Long Key nor are they known to have inhabited keys to the northward.

The hunters believe that these deer have no special season for breeding and that their summer coat is not essentially different from that of winter. They inhabit the densest cover of thorns, bushes and palmettos and can only be successfully pursued with dogs to chase the quarry past the waiting hunter stationed at some favorable point. After they have been hunted for a few consecutive days they go into the extensive prickly-pear hammocks and remain there for some time, of course, safe from pursuit. This happened coincident with two visits when we were trying for specimens as a result of Cuban hunting parties from Key West.

To one unfamiliar with field conditions in Florida, the very marked faunal differences between the southern keys and those extending northeast to the nearest portions of the peninsula itself, are almost as striking as they are unexpected. These southernmost islands are very different in character from those of the chain running northeast from Big Pine, including Boot Key, Grassy Key, Metacumbe Key and the extended Key Largo. The last, at its northern end, approaches the mainland of the peninsula but is well separated from it by a deep channel through which flows a swift current. These northern keys in all probability have a somewhat different geologic history and origin from the more southern or "lower" keys. The difference in the character of the two groups and their possibly independent connection with the mainland is sufficient to account for the considerable difference in their flora and fauna. For a most interesting exposition of the peculiar environmental conditions obtaining in these islands the reader is referred to the chapter on "The Florida Keys" in Charles Torrey Simpson's delightful book "In Lower Florida Wilds" (1920).

Specimens examined.—

FLORIDA; Big Pine Key, 3 (2 skins and skulls, and the type skull with head skin).

In the table following are given a few comparative skull measurements of the four races here considered. It would seem that after the exhaustive study made by Dr. J. C. Phillips (1920) these would be superfluous in the case of the race *borealis* but we have endeavored to select a few adults of each race, that appeared of maximum size and strictly comparable. This is of much importance for deer do not attain full size until they are several years old, so that cranial comparisons are often valueless unless the largest individuals of a series or those of quite comparable age are contrasted. For immature animals, however, it is possible to make accurate comparisons of several stages, of which we select three, namely: (I), skulls with three upper milk premolars and *first* permanent molar in place; (II) skulls with three milk premolars and *two* permanent molars in place; (III) skulls with three milk premolars and all *three* permanent molars in place. Deer

born in spring, are in stage I during the following fall, and by late spring have reached stage II. A deer with three milk molars and three permanent molars is usually at the beginning of the second fall, and before the third fall (2 yrs. old) has the complete dentition with "dag" antlers in the male.

Adult skulls

NAME	NUMBER	LOCALITY	SEX	CONDYLOBASAL LENGTH	AUDITOBASAL LENGTH	ZYGOMATIC WIDTH	UPPER CHEEK TEETH	LOWER CHEEK TEETH
<i>virginianus</i> ..	101491 U. S. N. M.	Va., Bath Co.	♂	282	255	126	76	81
<i>virginianus</i> ..	105558 U. S. N. M.	Va., Winchester	♂	—	255	114	79	88
<i>virginianus</i> ..	18945 M. C. Z.	Fla., Palm Beach	♂	290	268	117	77	87
<i>virginianus</i> ..	18944 M. C. Z.	Fla., Palm Beach	♂	—	263	124	81	86
<i>virginianus</i> ..	17759 M. C. Z.	Fla., New Smyrna	♀	256	239	100	79	88
<i>borealis</i>	4999 M. C. Z.	Me., Bucksport	♂	311	283	132	80	82
<i>borealis</i>	1733 M. C. Z.	Me., Upton	♂	289	261	124	81	89
<i>borealis</i>	11458 M. C. Z.	N. Y., Tupper Lake	♀	258	233	102	73	77
<i>borealis</i>	18753 M. C. Z.	Ont., Long Point	♀	262	241	110	76	83
<i>osceola</i>	18596 M. C. Z.	Fla., Chokoloskee	♂	255	234	106	77	81
<i>osceola</i>	18301 M. C. Z.	Fla., Chokoloskee	♂	253	232	99	72	78
<i>osceola</i>	18597 M. C. Z.	Fla., Chokoloskee	♂	—	—	110	77	83
<i>clavium</i>	19120 M. C. Z.	Fla., Big Pine Key	♂	240 [±]	215	106	67	73
<i>clavium</i>	18497 M. C. Z.	Fla., Big Pine Key	♂	195	181	89	62	70

I. Immature skulls, with dp²⁻⁴ m¹

NAME	NUMBER	LOCALITY	SEX	CONDYLOBASAL LENGTH	ZYGOMATIC WIDTH	CONDYLION TO p ²
<i>virginianus</i> ..	36971 U. S. N. M.	Va., Highland Co.	♂	195	86	135
<i>virginianus</i> ..	2384 U. S. N. M.	Va., Rowleysburg	♀	—	84	136
<i>virginianus</i> ..	122763 U. S. N. M.	So. Carolina	♀	199	85	132
<i>borealis</i>	1669 M. C. Z.	Me., Upton	♂	215	89	145
<i>borealis</i>	1675 M. C. Z.	Me., Upton	♀	226	95	154
? <i>osceola</i>	61849 U. S. N. M.	Fla., Polk Co.	♀	194	80	130

II. Immature skulls, with $dp^{2-4}m^{1-2}$

NAME	NUMBER	LOCALITY	SEX	CONDYLOBASAL LENGTH	ZYGOMATIC WIDTH	CONDYLION TO p^2
<i>virginianus</i> ..	111403 U. S. N. M.	Fla., Brevard Co.	♂	231	88	156
<i>borealis</i>	1695 M. C. Z.	Me.	♀	237	96	156
<i>borealis</i>	4221 M. C. Z.	Me., Bucksport	♂	235	99	160
<i>clavium</i>	18060 M. C. Z.	Fla., Big Pine Key	♂	191	83	131

III. Immature skulls, with $dp^{2-4}m^{1-3}$

NAME	NUMBER	LOCALITY	SEX	CONDYLOBASAL LENGTH	ZYGOMATIC WIDTH	CONDYLION TO p^2
<i>virginianus</i> ..	17558 U. S. N. M.	Va., Chesterfield	♀	—	96	156
<i>borealis</i>	83 M. C. Z.	(?) Maine	♀	244	108	166
<i>osceola</i>	18302 M. C. Z.	Fla., Chokoloskee	♀	221	87	151

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EXPLANATION OF PLATES

(All figures one-seventh natural size.)

PLATE 4

FIG. 1. Virginia Deer (*Odocoileus virginianus virginianus*), 38693 U. S. Nat. Mus., from Cumberland, Maryland. Adult male with large, normally developed antlers.

FIG. 2. Northern Virginia Deer (*Odocoileus virginianus borealis*), 13240 M. C. Z., from Oxford County, Maine. Adult male with average normal antlers, showing the tendency to spread at the tips.

PLATE 5

FIG. 3. Virginia Deer (*Odocoileus virginianus virginianus*), 19118 M. C. Z., from near Palm Beach, Florida. Adult male, with abnormally erect antlers, their tips nearly in contact.

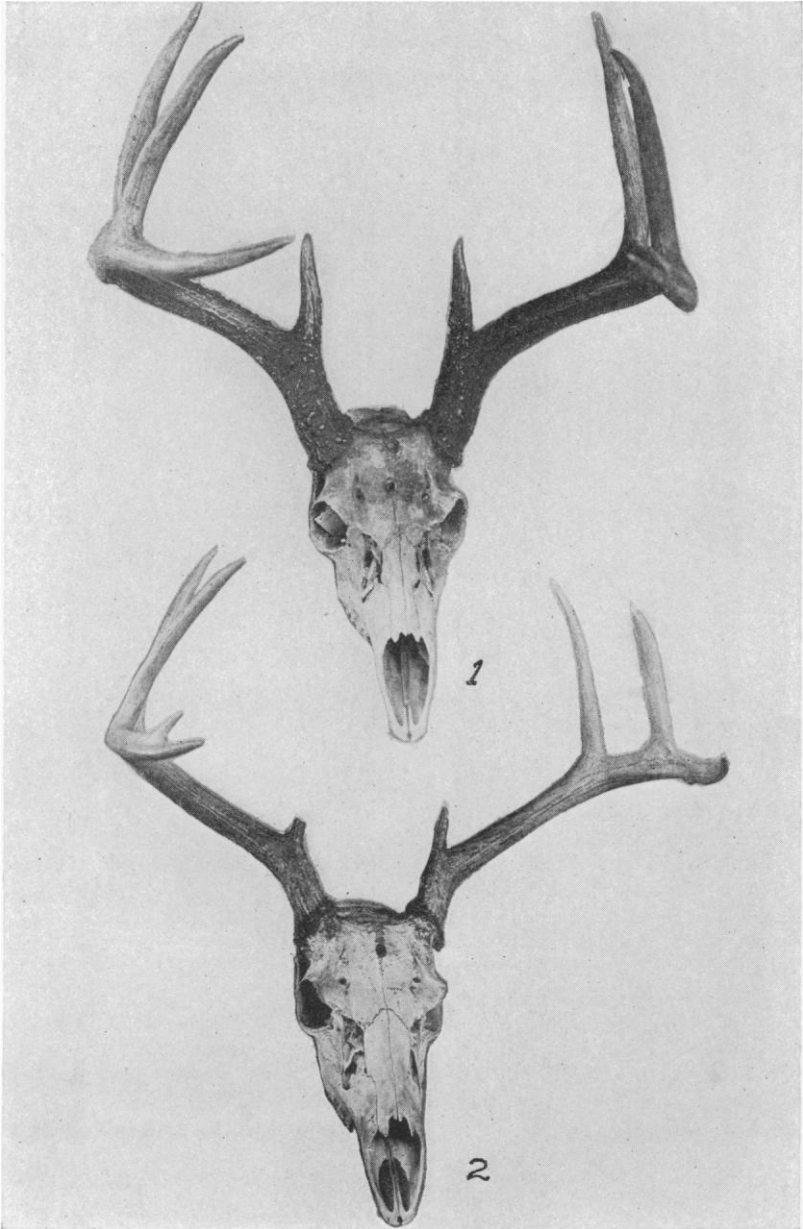
FIG. 4. Key Deer (*Odocoileus virginianus clavium*), 19120 M. C. Z., type, from Big Pine Key, Florida. Said to be a very large head for this race.

FIG. 5. Florida Deer (*Odocoileus virginianus osceola*), 18597 M. C. Z., from Chokoloskee, Florida. Adult male, with large normal antlers.

FIG. 6. Same, 18596 M. C. Z., Chokoloskee, Florida, adult, with average normal antlers.

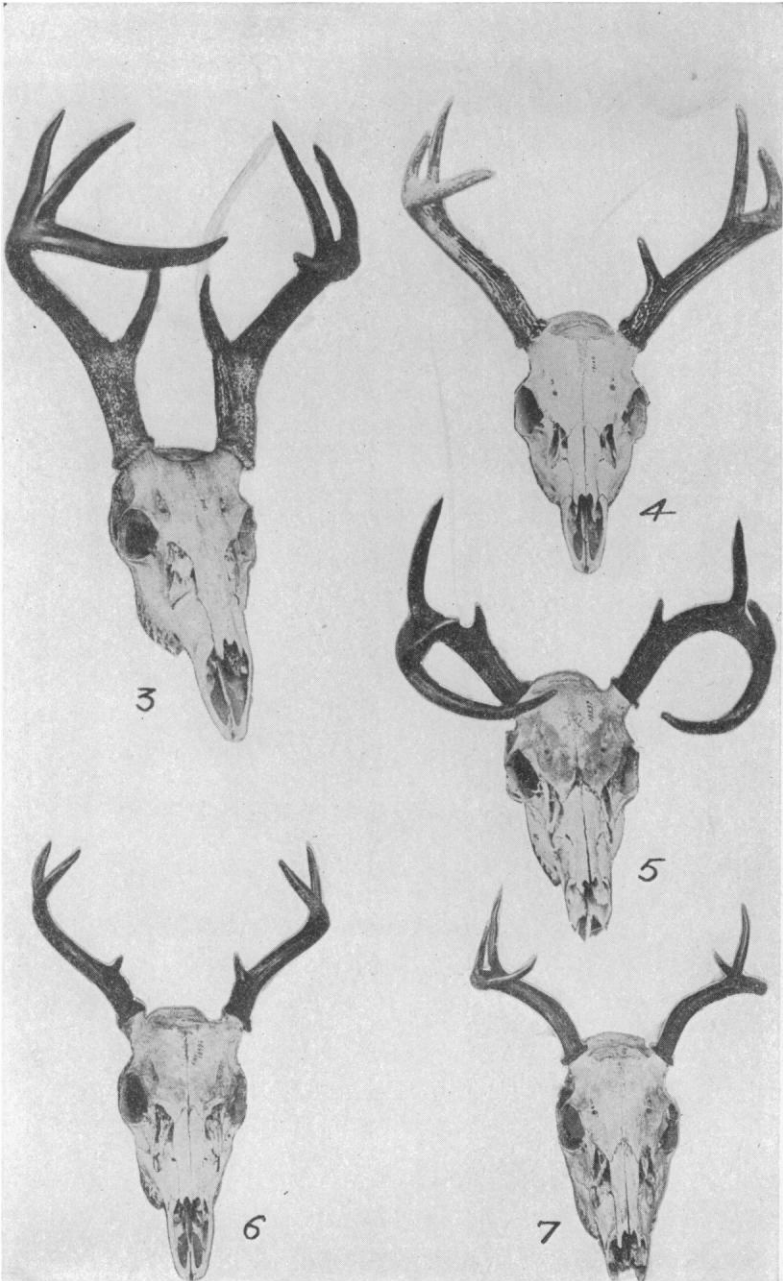
FIG. 7. Same, 18598 M. C. Z., Chokoloskee, Florida, adult. The antlers are asymmetrical in the number of points and lack the basal or "crown" tine.

Cambridge, Mass.



SKULLS OF WHITE-TAILED DEER

(Barbour and Allen: White-Tailed Deer.)



SKULLS OF WHITE-TAILED DEER

(Barbour and Allen: White-Tailed Deer.)